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NATIONAL DAM SAFETY PROGRAM. LAKE ZISKE DAM (MO 30071), MISSISS--ETC(U)
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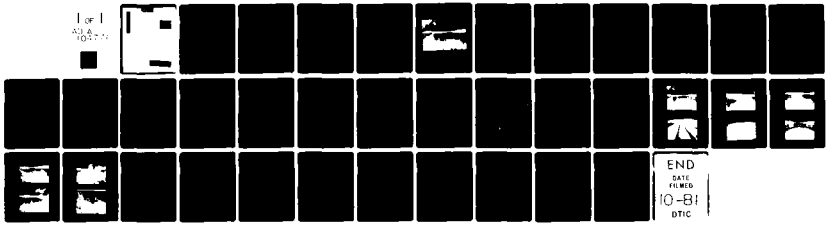

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REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
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4. TITLE (and Subtitle) Phase I Dam Inspection Report National Dam Safety Program Lake Ziske Dam (MO 30071) Dent County, Missouri		5. TYPE OF REPORT & PERIOD COVERED Final Report
		6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) Corps of Engineers, St. Louis District		8. CONTRACT OR GRANT NUMBER(s) N/A
9. PERFORMING ORGANIZATION NAME AND ADDRESS U.S. Army Engineer District, St. Louis Dam Inventory and Inspection Section, LMSED-PD 210 Tucker Blvd., North, St. Louis, Mo. 63101		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
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19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Dam Safety, Lake, Dam Inspection, Private Dams

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report was prepared under the National Program of Inspection of Non-Federal Dams. This report assesses the general condition of the dam with respect to safety, based on available data and on visual inspection, to determine if the dam poses hazards to human life or property.

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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

LAKE ZISKE DAM
DENT COUNTY, MISSOURI

MISSOURI INVENTORY NO. 30071

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

PREPARED BY: ST. LOUIS DISTRICT CORPS OF ENGINEERS
FOR: GOVERNOR OF MISSOURI

SEPTEMBER 1978

PHASE I REPORT

NATIONAL DAM SAFETY PROGRAM

Name of Dam	Lake Ziske Dam
State Located	Missouri
County Located	Dent
Stream	Tributary of Spring Creek
Date of Inspection	5 September 1978

Lake Ziske Dam (MO. Inventory No. 30071) was inspected by an interdisciplinary team of engineers from the St. Louis District, U. S. Army Corps of Engineers. The purpose of the inspection was to make an assessment of the general condition of the dam with respect to safety, based upon available data and visual inspection, in order to determine if the dam poses hazards to human life or property.

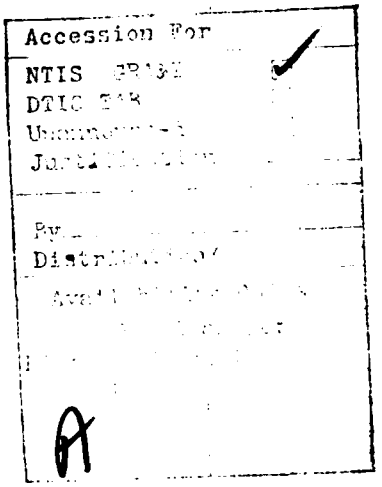
The guidelines used in the assessment were furnished by the Department of the Army, Office of the Chief of Engineers and developed with the help of several Federal and State agencies, professional engineering organizations, and private engineers. Based on these guidelines, this dam is classified in the high hazard classification, which means that loss of life and appreciable property loss could occur in the event of failure of the dam. The downstream damage zone is approximately 3 miles long. The Turner Lake and Dam is immediatey downstream of the Ziske Lake and Dam and would be subject to severe damage or destruction in the event of failure of this dam. In addition, there are three houses and associated buildings, 2 improved roads, and one railroad within the first two miles below the Turner Dam which would be subjected to flooding with possible damage and/or destruction and possible loss of life. The dam is in the small size classificaiton as it is less than 40 feet high and impounds less than 1000 acre-feet of water.

The inspection and evaluation indicates that the spillway of the Ziske Dam does not meet the criteria set forth in the guidelines for a dam having the above size and hazard potential. The spillway will not pass a one percent chance flood without overtopping. The Ziske Dam is a small size dam with a spillway that will pass 15 percent of the Probable Maximum Flood (PMF) without overtopping the dam. The guidelines require that a dam of this hazard potential (high) and size pass one-half of the Probable Maximum Flood —

without overtopping the dam. Since the spillway for Lake Ziske Dam is not capable of passing a minimum of one-half (50 percent) of the Probable Maximum Flood without overtopping the dam and causing failure, the spillway is considered seriously inadequate and the dam is accordingly considered unsafe. Also, our evaluation indicates it will not pass the one percent chance flood. A one percent chance flood is a flood that would have a one percent chance of being exceeded in any given year.

Other deficiencies visually observed by the inspection team were the need for cutting the tall grass and brush (some small tress) on the dam slopes, and the need for riprap protection on the upstream face of the embankment to prevent erosion and an erosion resistant spillway. The lack of stability and seepage analysis on record is a deficiency that should be corrected.

It is recommended that the owner take action to correct or control the deficiencies described.



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Soils Engineer
St. Louis District
Corps of Engineers

SUBMITTED BY: for Chief, Engineering Division — 28 Sep 78 Date

APPROVED BY: Coldnel, CE, District Engineer — 28 Sep 78 Date

OVERVIEW OF LAKE AND DAM

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
LAKE ZISKE DAM - ID NO. 30071

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PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
LAKE ZISKE DAM - ID NO. 30071

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

a. Authority. The National Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of safety inspection of dams throughout the United States. Pursuant to the above, the St. Louis District, Corps of Engineers, District Engineer directed that a safety inspection of the Lake Ziske Dam be made.

b. Purpose of Inspection. The purpose of the inspection was to make an assessment of the general condition of the dam with respect to safety, based upon available data and visual inspection, in order to determine if the dam poses hazards to human life or property.

c. Evaluation Criteria. Criteria used to evaluate the dam were furnished by the Department of the Army, Office of the Chief of Engineers, in "Recommended Guidelines for Safety Inspection of Dams." These guidelines were developed with the help of several Federal agencies and many state agencies, professional engineering organizations, and private engineers.

1.2 DESCRIPTION OF PROJECT

a. Description of Dam and Appurtenances.

(1) The dam is an earth fill dam with an earthen spillway in the right abutment and an outlet pipe with a drop inlet structure near the center of the dam.

b. Location: The dam is located in the central portion of Dent County, Missouri, two miles due east of the city of Salem. The lake area is located in the Salem, Missouri quadrangle sheet in the SW 1/4 of the NE 1/4 of Section 17, Township 34 North, Range 5 West.

c. Size Classification: Small.

d. Hazard Classification: High

e. Ownership. Dr. T. M. Ziske, Salem, Missouri

f. Purpose of Dam. The dam forms a 29 acre recreational lake.

g. Design and Construction History. The dam was constructed in 1965 by the Earl Dean Smith Construction Company for the present owner. The Soil Conservation Service of the U. S. Department of Agriculture, Salem, Missouri, provided the owner with design guidelines and made occasional inspections during the dam construction. This information is available in their Salem, Missouri office.

h. Normal Operating Procedure. No operating records exist. Outflow passes through the overflow pipe or over the uncontrolled grassy spillway during unusually heavy rain conditions. Estimated outlet facilities capacity at maximum pool elevation - 300 cfs.

1.3 PERTINENT DATA

a. Drainage Area - 375 acres

b. Discharge at Damsite.

Discharge at the damsite is through a 24-inch overflow intake pipe with a 14-inch outlet pipe (uncontrolled) and an uncontrolled grassy spillway 1 foot above the overflow pipe in the right abutment. Estimated outlet facilities capacity at maximum pool elevation - 300 cfs.

c. Elevation (Feet Above M.S.L.).

(1) Top of dam - 1164 (See PLATES 2 and 3)

(2) Crest of overflow pipe - 1161.0

(3) Invert of 14-inch pipe - 1157.2

(4) Spillway crest - 1162.2

(5) Streambed at Centerline of Dam - Unknown - Turner Lake immediately downstream of dam toe - elevation under surface 1145.64

(6) Maximum tailwater - unknown

d. Reservoir. 2000 feet

e. Storage. - Top of dam - 343 acre-feet
Recreational pool - 251

f. Reservoir Surface Area (Acres).

(1) Top of dam - 30

(2) Spillway crest - 29

g. Dam.

Type - earth fill.

Length - 500 feet.

Height - 24 feet

Top width - 10 feet.

Side Slopes -

(a) Downstream: 1V on 2H

(b) Upstream: 1V on 2H

Zoning - unknown.

Impervious Core - Unknown

Cutoff - 200 feet long, 20 feet deep.

Grout curtain - none

h. Diversion and Regulating Tunnel.

(1) Type - 24" drop inlet spillway with 14-inch steel pipe outlet.

(2) Length - 86 feet (14-inch pipe).

(3) Construction - close riveted with watertight connections.

(4) Gates - None

(5) Inlet Elevation - Drop inlet - 1161.0 feet msl
14-inch pipe 1157.2 feet msl

i. Spillway.

(1) Type - earth fill

(2) Length of weir - none

(3) Crest elevation - 1162.2 feet msl.

j. Regulating Outlets. None

SECTION 2 - ENGINEERING DATA

2.1 DESIGN.

No design drawings exist. Assistance in the design of the dam was obtained by the owner from the Soil Conservation Service, U. S. Department of Agriculture, Salem, Missouri, who provided guidelines only.

2.2 CONSTRUCTION. The dam was built in 1965 by the Earl Dean Smith Construction Company, for the present owner. The Soil Conservation Service also assisted in the supervision of the construction and has on file some records made during the construction. A copy of pertinent data has been requested.

The dam reportedly has a cutoff trench 200 feet long and 20 feet deep and contains approximately 4,860 cubic yards of fill. Bedrock was not exposed in the bottom of the cut-off trench. A considerable amount of water was encountered during the excavation.

The dam is approximately 500 feet long with a spillway 100 feet long extending to the north or the right abutment. There are approximately 18,250 cubic yards of fill in the combined structures. The dam fill material consisted of chert and silty-clay loam.

There is an overflow intake pipe structure at approximately the center of the dam and 2 to 3 feet out from upstream side of the dam. (See photograph 10). The inlet is approximately 1 foot below the spillway elevation and 3 feet below the top of the dam. The intake structure and discharge pipe consist of a 24-inch overflow pipe and a 14-inch metal discharge pipe approximately 86 feet long.

2.3 OPERATION.

No operating records exist. Outflow passes over the intake pipe structure or over the uncontrolled spillway under heavy flooding conditions.

2.4 EVALUATION.

a. Availability. The only available engineering data are the records kept by the Soil Conservation Service, Salem, Missouri. The information gained from this source was verbal. Copies of pertinent information has been requested and will be documented. The owner also has some design data but were not readily accessible.

b. Adequacy. The data obtained from the Soil Conservation Service and the field surveys, and visual inspections presented herein, are considered adequate to support the conclusions of this report. Seepage and stability analyses as prescribed by the guidelines are not on record. This is a deficiency which should be rectified.

c. Validity. Verbal conversation with Soil Conservation Service, Salem, Missouri, who assisted owner with design and inspection of dam construction. Accuracy of information will be compared with records as they become available.

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

a. General. The owner did not accompany the inspection team. Ziske Lake is the upper lake in the watershed. The lower lake, Turner Lake, was inspected the same day (see report on Turner Lake). A smaller lake was constructed in what is now Ziske Lake but it was removed after Ziske Lake was completed.

b. Project Geology. No rock outcrops are visible at the site; however, the abutment soil contains residuum of the Lower Ordivician Roubideux and Gasconade formations, indicating that the reservoir is underlain by Gasconade dolomite. Reportedly, no bedrock was encounted during excavations prior to placement of the dam embankment, and the embankment was constructed from a cherty clay excavated from the reservoir area upstream of the dam.

Witnesses have reported that springs flowed into the impoundment area before the dam was constructed, and that, due to the wet condition of the borrow area, excavation was accomplished by dragline. A small seep of rust-colored water was observed flowing into Turner Lake from the abutment opposite the spillway, directly downstream of Ziske Dam.

c. Dam. No detrimental settlement, cracking or sinkholes were observed in or near the earth embankment.

An embankment cross-section near the maximum height for the dam is shown on PLATE 3. In a few areas, the embankment slopes are considerably steeper than the section shown. It is difficult to determine the reason for the irregular slopes, especially since there was heavy vegetation on the slope but it appears that the slope was constructed irregularly. No burrows were noted, but some could be present and masked by vegetation.

The dam had some brush and small trees near the abutments. The root system of the brush constitutes a potential seepage hazard, especially from the brush between the dam and the spillway. There is a heavy growth of vegetation on the dam. The vegetation also provides animal habitat which increases the likelihood of animal burrows.

Based upon surface observations, the dam is composed of clay and rock.

There is no riprap either on the upstream or downstream slope.

There was no observed seepage along the central portion of the embankment. There is some possible seepage that was reported as a possible spring in the section on geology. No actual flow was observed but a rust colored stain was observed in the water (Turner Lake) and up the slope from the water. Additionally, a steady seepage condition could exist between the embankment and the spillway where there is brush and at least one type of plant that prefers moist conditions.

d. Appurtenant Structures. Appurtenant structures consist of a grassy spillway and an overflow intake structure and discharge pipe. The spillway is approximately 100 feet wide by 15 feet high by 300 feet long. The spillway extends from the dam embankment down past the toe of the dam. It is composed of embankment or foundation material. Any high and sustained flows thru the emergency spillway could cause excessive erosion of the embankment. Rock observed on top of the overflow intake (Photo 10) was placed to prevent the intake structure from becoming filled with debris. The presence of the rock on the intake structure should not prevent the overflow intake from functioning properly.

e. Reservoir Area. No pertinent problems were noted in the reservoir area.

f. Downstream Area. Since Turner Lake extends to the toe of Ziske Dam, there is no downstream channel.

3.2 EVALUATION. Insufficient erosion protection on the upstream face of the embankment and insufficient erosion protection in the spillway are deficiencies which should be corrected. Also, the tall grasses, weeds, and brush on the embankment should be cut and maintained to prevent them from providing an animal habitat and possible burrowing by such animals.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 PROCEDURES.

Operational procedures are essentially nonexistant since the dam has an uncontrolled overflow pipe structure and spillway over which water passes freely.

4.2 MAINTENANCE OF DAM.

Little recent maintenance is apparent as evidenced by the vegetative cover, brush and small trees growing on the dam and spillway areas.

4.3 MAINTENANCE OF OPERATING FACILITIES.

No operating facilities exist.

4.4 DESCRIPTION OF ANY WARNING SYSTEM IN EFFECT.

None exist.

4.5 EVALUATION.

Additional maintenance in the form of clearing and mowing of embankments is recommended.

SECTION 5 - HYDRAULIC/HYDROLOGIC

5.1 EVALUATION OF FEATURES.

a. Design Data. Design data are not available.

b. Experience Data. All of the pertinent data furnished in this report were obtained from U. S. Geological Survey 15 Minute Quadrangle Sheets or from surveys made during the inspection.

c. Visual Observations.

(1) The level of the lake is controlled by a conduit spillway which is located near the center of the dam approximately 24 feet upstream of the axis of the dam. The conduit spillway consists of a 24-inch diameter steel drop inlet with a grate on the top and a 14-inch steel pipe through the dam at the bottom of the drop inlet. The inverts of the drop inlet and the 14-inch pipe are at elevations 1161.0 feet and 1157.2 feet msl, respectively. (See photograph 10.)

(2) A grassy spillway located at the right side of the dam serves as an emergency spillway (see PLATES 2 and 3 and photograph 9). Any high and sustained flows through the emergency spillway could cause excessive erosions of the embankment. The excessive erosions could threaten the safety of the dam.

(3) Drawdown facilities necessary to evacuate the lake are not provided.

(4) Turner Lake is located immediately downstream of the dam.

d. Overtopping Potential.

The conduit spillway and the emergency spillway are too small to pass one-half of the Probable Maximum Flood (PMF), or one percent chance flood (100-year flood). The Probable Maximum Flood is defined as the flood discharge that may be expected from the most severe combination of critical meteorologic and hydraulic conditions that are reasonably possible in the region. A one percent chance flood is a flood that would have a one percent chance of being exceeded in any given year. The spillway will pass 15 percent of the PMF without overtopping. Routing the one-half PMF through the lake reveals that the dam would be overtopped for approximately 5.2 hours with a maximum 2.1 feet water and 2350 cfs discharge over the low point of the dam.

The tsunami wave from a sudden collapse of this dam could threaten the safety of the Turner Dam downstream.

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY.

a. Visual Observations. Visual observations of the dam and spillway are discussed and evaluated in Sections 3 and 5. The dam has no other appurtenant structures.

b. Design and Construction Data. Design and construction data were discussed in Section 2. Seepage and stability analyses comparable to the requirements of the "Recommended Guidelines for Safety Inspection of Dams" were not available, which is considered a deficiency. These seepage and stability analyses should be performed for appropriate loading conditions (including earthquake loads) and make a matter of record.

c. Operating Records. None available.

d. Post Construction Changes. According to owner, none have occurred.

e. Seismic Stability. Ziske Dam is located is seismic zone 2 for which the recommended guidelines for inspection assign a "moderate" damage probability. Since neither original design analyses nor strengths of embankment or foundation materials are available, an accurate seismic analysis cannot be made. However, the relatively low height and the type of material of which the dam was constructed minimize the likelihood of failure due to earthquake shock.

SECTION 7 - ASSESSMENT/REMEDIAL MEASURES

7.1 DAM ASSESSMENT.

a. Safety. Several items are deficient which should be corrected. No erosion protection exists on the upstream slope of the dam. The spillway is not adequately protected against erosion. The spillway capacity of the dam is insufficient to pass 50 percent of the Probable Maximum Flood without overtopping the dam. Brush and heavy vegetation on the embankment should be cut and maintained to prevent them from providing an animal habitat and possible borrowing from such animal. Any trees should be removal to prevent potential seepage hazard.

b. Adequacy of Information. The statements and recommendations in this report are based on visual observations and verbal discussions with the Soil Conservation Service, U. S. Department of Agriculture. Seepage and stability analyses are not on record as prescribed in the recommended guidelines. The downstream embankment toe is covered by Turner Lake and an assessment of seepage conditions could not be made.

c. Urgency. We recommend that the remedial measures listed in Section 7.2 be accomplished in the near future. The item recommended in paragraph 7.2d should be pursued on a high-priority basis.

d. Need for Phase II. No Phase II inspection is recommended.

7.2 REMEDIAL MEASURES.

The following remedial measures are recommended:

a. Remove brush and any small trees; however, this should not be done on the upstream slope until riprap placement can follow immediately thereafter.

b. Fill any animal burrows found during clearing.

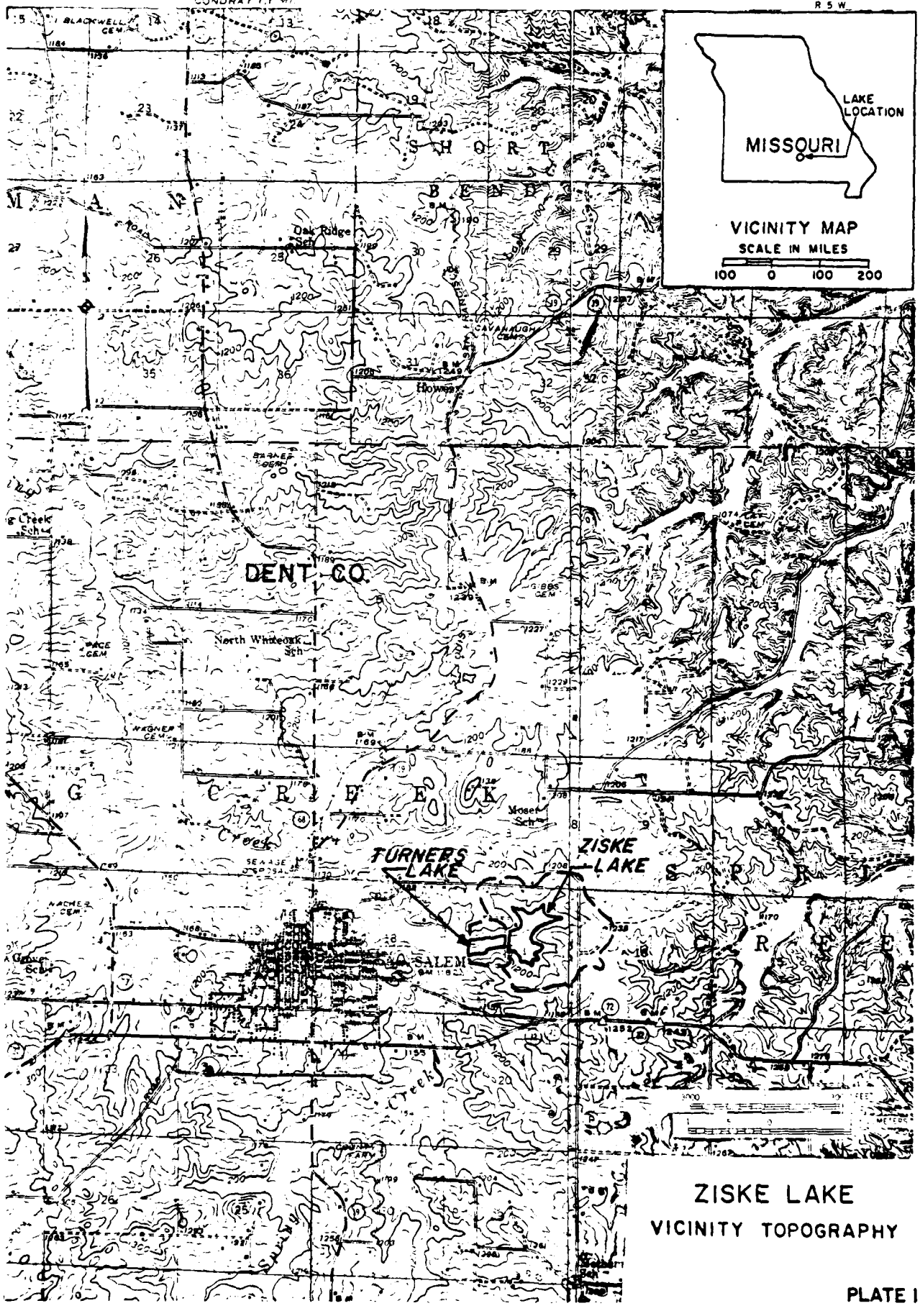
c. The tall vegetation on the embankment should be cut and maintained.

d. Provide an adequately sized, erosion-resistant spillway. Spillways should be designed and constructed to pass at least one-half of the Probable Maximum Flood.

e. A stability and seepage analysis of the dam should be performed by a professional engineer experienced in the design and construction of dams.

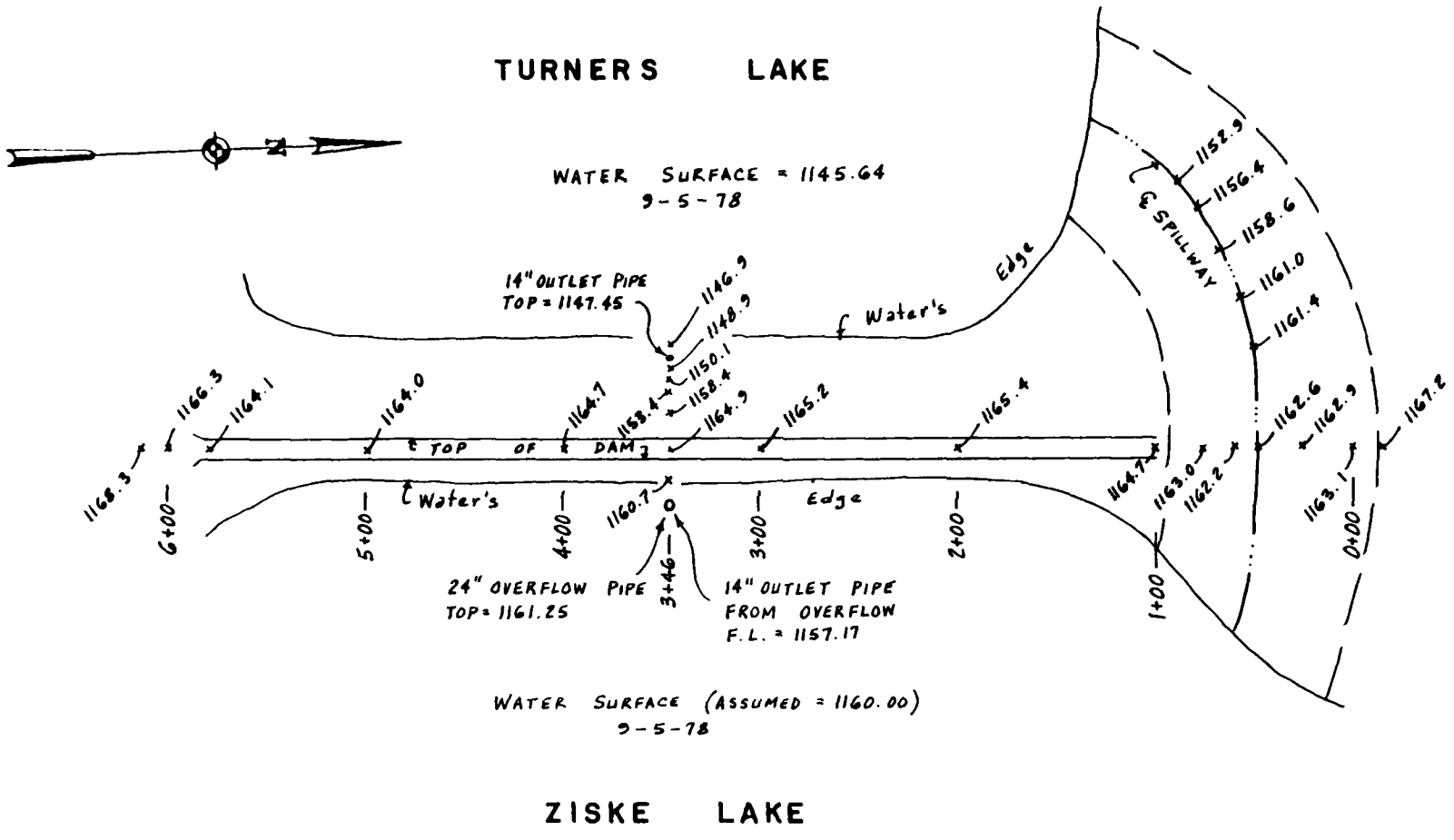
f. A detailed inspection of the dams and spillways should be made every two to five years by a professional engineer experienced in the design and construction of dams. Records should be kept of these inspections and major maintenance.

g. The residents near Ziske Dam should be advised of the flooding potential from overtopping or failure of the dam.



ZISKE LAKE
VICINITY TOPOGRAPHY

PLATE I



ZISKE LAKE DAM
PLAN

SCALE IN FEET

80 0 80

PLATE 2

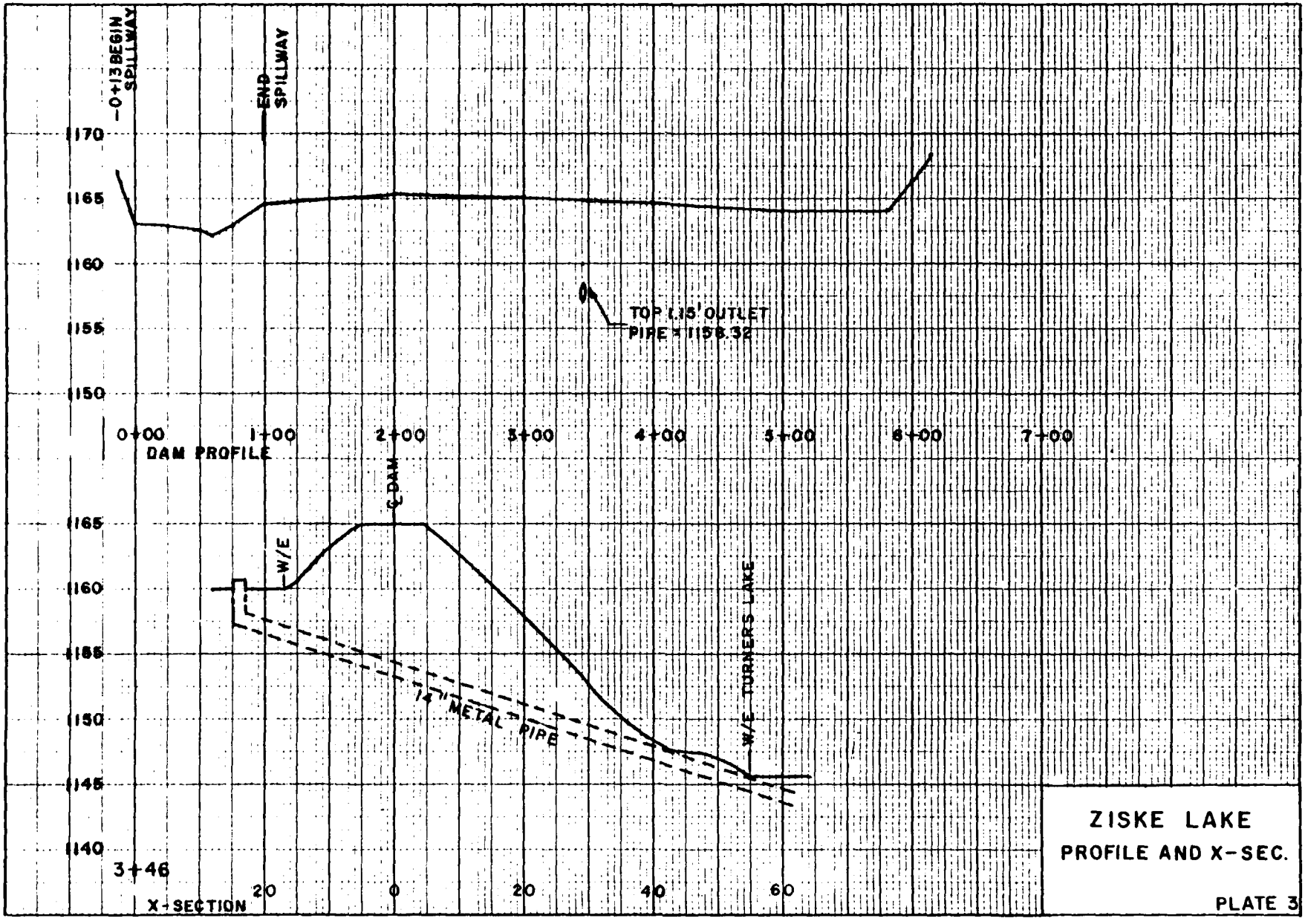

0+13 BEGIN SPILLWAY
END SPILLWAY
1170
1165
1160
1155
1150
TOP 15' OUTLET PIPE = 1158.32
0+00
DAM PROFILE
1+00
2+00
3+00
4+00
5+00
6+00
7+00
℄ DAM
W/E
W/E TURNERS LAKE
14" METAL PIPE
1165
1160
1155
1150
1145
1140
3+46
X-SECTION
20
0
20
40
60
ZISKE LAKE
PROFILE AND X-SEC.
PLATE 3

Photo 1: Overview of the Lake and Dam

Photo 2: Crest of Dam

Photo 3: Upstream Slope of Dam

Photo 4: Downstream Slope of Dam

Photo 5: Center of Upstream Slope and Lake

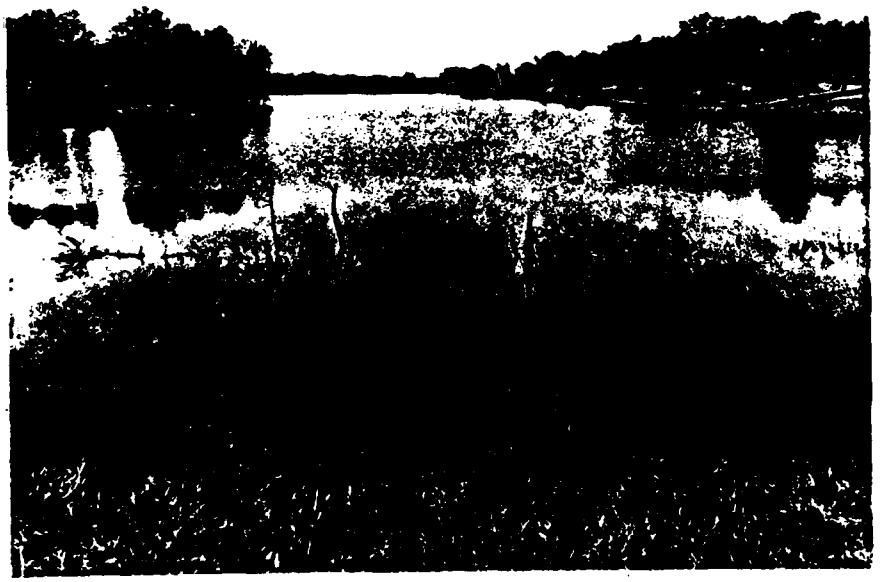


Photo 6: Center of Downstream Slope and Turner Lake Below

Photo 7: Right Upstream Slope and North End of Lake

Photo 8: Left Upstream Slope and South End of Lake

Photo 9: Spillway at Right Abutment

Photo 10: Overflow Intake Center
Upstream of Dam

APPENDIX A

HYDROLOGIC AND HYDRAULIC ANALYSIS METHODOLOGY

HYDROLOGIC AND HYDRAULIC ANALYSIS METHODOLOGY

1. The hydrologic analysis used in development of the overtopping potential is based on applying a hypothetical storm to a unit hydrograph to obtain the inflow hydrograph for a reservoir routing. The Probable Maximum Precipitation is derived and determined from regional charts prepared by the National Weather Service in "Hydrometeorological Report No. 33." Reduction factors have not been applied. A 24-hour storm duration is assumed with the total rainfall depth distributed over 6-hour periods in accordance with procedures outlined in EM 1110-2-1411 (SPF Determination). The maximum 6-hour rainfall period is then distributed to hourly increments by the same criteria. Within-the-hour distribution is based upon NOAA Technical Memorandum NWS HYDRO-35. The non-peak 6-hour rainfall periods are distributed uniformly. All distributed values are arranged in a critical sequence by the SPF criteria. The final inflow hydrograph is produced by deduction of infiltration losses appropriate to the soil, land use, and antecedent moisture conditions.

2. The reservoir routing is accomplished by using Modified Puls routing techniques wherein the flood hydrograph is routed through lake storage. Hydraulic capacities of the outlet works, spillway, and crest of dam are used as outlet controls in the routing. Storage in the pool area is defined by an elevation-storage capacity curve. The hydraulic capacity of the outlet works, spillway, and top of dam are defined by elevation-discharge curves.

3. Dam overtopping analysis has been conducted by hydrologic methods for this dam and lake. This computation determines the percentage of the PMF hydrograph that the reservoir can contain without the dam being overtopped. An output summary in the hydrologic appendix displays this information as well as other characteristics of the simulated dam overtopping.

4. The above analysis has been accomplished for this report using the systemized computer program HEC-1 (Dam Safety Version), July 1978, prepared by the Hydrologic Engineering Center, U.S. Army Corps of Engineers, Davis, California. The numeric parameters estimated for this site are listed in the attached computer printout. Definitions of these variables are contained in the "User's Manual" for the computer program.

5. Hydrologic and Hydraulic Data.

(a) The capacity of the conduit spillway is controlled by the 14-inch pipe with inlet control.

(b) Rating curves for emergency spillway and top of the dam derived from the assumption of critical flows over the crest. A loss of 0.5 velocity head is considered for spillway flow before overtopping.

```
THE PEC-1 AUTOMATICALLY INTERPOLATES INITIAL STORAGE-FLOW, STAGE-FLOW
AND STORAGE-OUTFLOW DEVICES.

FOR TECHNICAL ASSISTANCE CONTACT
ARLEE FELDMAN, JOHN PETTIS, OR PAUL ELY
AT THE HYDROLOGIC ENGINEERING CENTER
(916-440-2329 (FTS 448-2329)
1**********
 FLOOD HYDROGRAPH PACKAGE (PEC-1)
 DAM SAFETY VERSION      JULY 1978
   LAST MODIFICATION  12 SEP 78
 **********
     1                AI         DAM INSPECTION 5 SEPTEMBER 1978
     2                A2         ZISSE DAM SALAM MO
     3                A3         SCS HYDROGRAPHS PEP AND ZPPP
     4                B     288        0        5        0        0        0        0        0       -5        0
     5                P1      5
     6                J       1        6        1
     7                J1    1.0      .10      .15      .20      .30      .50
     8                K       0        1        0        0        1        0        1
     9                F1         CALCULATION OF INFLOW HYDROGRAPH OF ZISEE DAM
    10                P       1        2      .59        0        0        1        0        0        1
    11                P       0       26      102      121      130
    12                T       0        0        0        0        0        0       -1      -89
    13                W2      0      .18
    14                X      30       40        2
    15                P       1        2        0        0        1        0        1
    16                F1         ROUTED FLOW THROUGH EMERGENCY SPILLWAY AND TOP OF DAM
    17                Y       0        0        0        0        1        1
    18                Y1      1        0        0        0        0        0    -1161.0       -1
    19                Y4 1161.0   1163.3   1164.1     1165     1166     1167   1167.4   1167.8   1168.5   1172.6
    20                Y5      0       94      300      900     2000     4000     5000     6800    14500    44800
    21                YA      0       29       29       31       35
    22                YE   1155     1161     1162     1165     1170
    23                YY   1161
    24                YD1164.1
    25                K      99
1                          PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

                                 RUNOFF HYDROGRAPH AT            1
                                 ROUTE HYDROGRAPH TO             2
                                 END OF NETWORK


1**********
 FLOOD HYDROGRAPH PACKAGE (PEC-1)
 DAM SAFETY VERSION      JULY 1978
   LAST MODIFICATION  12 SEP 78
 **********

 RUN  DATE= 78/09/14.
      TIME= 07.00.13.


                          DAM INSPECTION 5 SEPTEMBER 1978
                          ZISEE DAM SALAM MO
                          SCS HYDROGRAPHS PEP AND ZPPP

                                  [illegible] SPECIFICATIONS
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DAM INSPECTION 5 SEPTEMBER 1978
ZISKE DAM SALAM MO
SCS HYDROGRAPHS PMP AND 1PMP

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
288	0	5	0	0	0	0	0	-5	0
			JOPER	NWT	LROPT	TRACE			
			5	0	0	0			

********** ********** ********** ********** **********

SUB-AREA RUNOFF COMPUTATION

CALCULATION OF INFLOW HYDROGRAPH OF ZISKE DAM

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
1	0	0	0	1	3	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	2	.59	0.00	.59	1.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	26.00	102.00	121.00	130.00	0.00	0.00	0.00

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	-1.00	-89.00	0.00	0.00

CURVE NO = -89.00 WETNESS = -1.00 EFFECT CN = 89.00

UNIT HYDROGRAPH DATA
TC= .0.00 LAG= .18

RECESSION DATA
STRTQ= 30.00 QRCSN= 40.00 RTIOR= 2.00

UNIT HYDROGRAPH 13 END OF PERIOD ORDINATES, TC= 0.00 HOURS, LAG= .18 VOL= 1.00

361. 1126. 1249. 867. 439. 244. 131. 70. 38. 21.
12. 6. 1.

0
END-OF-PERIOD FLOW

MO,DA	HR,MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO,DA	HR,MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
1,01	.05	1	.01	0.00	.01	28.	1,01	12,05	145	.22	.21	.01	556.
1,01	.10	2	.01	0.00	.01	26.	1,01	12,10	146	.22	.21	.01	523.
1,01	.15	3	.01	0.00	.01	24.	1,01	12,15	147	.22	.21	.01	708.
1,01	.20	4	.01	0.00	.01	23.	1,01	12,20	148	.22	.22	.01	837.
1,01	.25	5	.01	0.00	.01	21.	1,01	12,25	149	.22	.22	.01	903.

1.01	.[illegible]	4	.01	0.00	.01	23.	1.01	12.20	148	.22	.22	.01	857.
1.01	[illegible]	5	.01	0.00	.01	21.	1.01	12.25	149	.22	.22	.01	3.
1.01	.30	6	.01	0.00	.01	20.	1.01	12.30	150	.22	.22	.01	.41.
1.01	.35	7	.01	0.00	.01	18.	1.01	12.35	151	.22	.22	.00	962.
1.01	.40	8	.01	0.00	.01	17.	1.01	12.40	152	.22	.22	.00	973.
1.01	.45	9	.01	0.00	.01	16.	1.01	12.45	153	.22	.22	.00	980.
1.01	.50	10	.01	0.00	.01	15.	1.01	12.50	154	.22	.22	.00	984.
1.01	.55	11	.01	0.00	.01	14.	1.01	12.55	155	.22	.22	.00	987.
1.01	1.00	12	.01	0.00	.01	13.	1.01	13.00	156	.22	.22	.00	989.
1.01	1.05	13	.01	0.00	.01	12.	1.01	13.05	157	.27	.26	.00	1006.
1.01	1.10	14	.01	0.00	.01	11.	1.01	13.10	158	.27	.26	.00	1056.
1.01	1.15	15	.01	0.00	.01	11.	1.01	13.15	159	.27	.26	.00	1111.
1.01	1.20	16	.01	0.00	.01	10.	1.01	13.20	160	.27	.26	.00	1150.
1.01	1.25	17	.01	0.00	.01	9.	1.01	13.25	161	.27	.26	.00	1170.
1.01	1.30	18	.01	0.00	.01	9.	1.01	13.30	162	.27	.26	.00	1181.
1.01	1.35	19	.01	0.00	.01	8.	1.01	13.35	163	.27	.26	.00	1188.
1.01	1.40	20	.01	.00	.01	8.	1.01	13.40	164	.27	.26	.00	1192.
1.01	1.45	21	.01	.00	.01	7.	1.01	13.45	165	.27	.26	.00	1194.
1.01	1.50	22	.01	.00	.01	7.	1.01	13.50	166	.27	.26	.00	1196.
1.01	1.55	23	.01	.00	.01	8.	1.01	13.55	167	.27	.26	.00	1197.
1.01	2.00	24	.01	.00	.01	8.	1.01	14.00	168	.27	.26	.00	1198.
1.01	2.05	25	.01	.00	.01	9.	1.01	14.05	169	.33	.33	.00	1222.
1.01	2.10	26	.01	.00	.01	10.	1.01	14.10	170	.33	.33	.00	1297.
1.01	2.15	27	.01	.00	.01	10.	1.01	14.15	171	.33	.33	.00	1379.
1.01	2.20	28	.01	.00	.01	11.	1.01	14.20	172	.33	.33	.00	1437.
1.01	2.25	29	.01	.00	.01	12.	1.01	14.25	173	.33	.33	.00	1466.
1.01	2.30	30	.01	.00	.01	13.	1.01	14.30	174	.33	.33	.00	1483.
1.01	2.35	31	.01	.00	.01	13.	1.01	14.35	175	.33	.33	.00	1492.
1.01	2.40	32	.01	.00	.01	14.	1.01	14.40	176	.33	.33	.00	1497.
1.01	2.45	33	.01	.00	.01	15.	1.01	14.45	177	.33	.33	.00	1500.
1.01	2.50	34	.01	.00	.01	15.	1.01	14.50	178	.33	.33	.00	1502.
1.01	2.55	35	.01	.00	.01	16.	1.01	14.55	179	.33	.33	.00	1503.
1.01	3.00	36	.01	.00	.01	17.	1.01	15.00	180	.33	.33	.00	1504.
1.01	3.05	37	.01	.00	.01	17.	1.01	15.05	181	.20	.20	.00	1458.
1.01	3.10	38	.01	.00	.01	18.	1.01	15.10	182	.40	.40	.00	1385.
1.01	3.15	39	.01	.00	.01	19.	1.01	15.15	183	.40	.40	.00	1450.
1.01	3.20	40	.01	.00	.01	19.	1.01	15.20	184	.60	.60	.00	1661.
1.01	3.25	41	.01	.00	.01	20.	1.01	15.25	185	.71	.70	.00	2041.
1.01	3.30	42	.01	.00	.01	20.	1.01	15.30	186	1.71	1.71	.01	2823.
1.01	3.35	43	.01	.00	.01	21.	1.01	15.35	187	2.82	2.81	.01	4685.
1.01	3.40	44	.01	.00	.01	22.	1.01	15.40	188	1.11	1.11	.00	6762.
1.01	3.45	45	.01	.00	.01	22.	1.01	15.45	189	.71	.70	.00	7050.
1.01	3.50	46	.01	.01	.01	23.	1.01	15.50	190	.60	.60	.00	5884.
1.01	3.55	47	.01	.01	.01	23.	1.01	15.55	191	.40	.40	.00	4477.
1.01	4.00	48	.01	.01	.01	24.	1.01	16.00	192	.40	.40	.00	3446.
1.01	4.05	49	.01	.01	.01	24.	1.01	16.05	193	.31	.31	.00	2705.
1.01	4.10	50	.01	.01	.01	25.	1.01	16.10	194	.31	.31	.00	2179.
1.01	4.15	51	.01	.01	.01	25.	1.01	16.15	195	.31	.31	.00	1845.
1.01	4.20	52	.01	.01	.01	26.	1.01	16.20	196	.31	.31	.00	1643.
1.01	4.25	53	.01	.01	.01	26.	1.01	16.25	197	.31	.31	.00	1537.
1.01	4.30	54	.01	.01	.01	27.	1.01	16.30	198	.31	.31	.00	1476.
1.01	4.35	55	.01	.01	.01	27.	1.01	16.35	199	.31	.31	.00	1440.
1.01	4.40	56	.01	.01	.01	28.	1.01	16.40	200	.31	.31	.00	1423.
1.01	4.45	57	.01	.01	.01	28.	1.01	16.45	201	.31	.31	.00	1416.
1.01	4.50	58	.01	.01	.01	29.	1.01	16.50	202	.31	.31	.00	1412.
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1.01	16.55	203	.31	.31	.00	1411.

1.01	[illegible]	61	.01	.01	.01	20.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1.01	5. [illegible]	62	.01	.01	.01	50.	1.01	17.10	206	.24	.24	.00	31c.
1.01	5.15	63	.01	.01	.01	51.	1.01	17.15	207	.24	.24	.00	29.
1.01	5.20	64	.01	.01	.01	31.	1.01	17.20	208	.24	.24	.00	1172.
1.01	5.25	65	.01	.01	.01	32.	1.01	17.25	209	.24	.24	.00	1145.
1.01	5.30	66	.01	.01	.01	32.	1.01	17.30	210	.24	.24	.00	1127.
1.01	5.35	67	.01	.01	.01	32.	1.01	17.35	211	.24	.24	.00	1118.
1.01	5.40	68	.01	.01	.01	33.	1.01	17.40	212	.24	.24	.00	1114.
1.01	5.45	69	.01	.01	.01	33.	1.01	17.45	213	.24	.24	.00	1111.
1.01	5.50	70	.01	.01	.01	33.	1.01	17.50	214	.24	.24	.00	1110.
1.01	5.55	71	.01	.01	.01	34.	1.01	17.55	215	.24	.24	.00	1109.
1.01	6.00	72	.01	.01	.01	34.	1.01	18.00	216	.24	.24	.00	1109.
1.01	6.05	73	.07	.04	.03	47.	1.01	18.05	217	.02	.02	.00	1028.
1.01	6.10	74	.07	.04	.03	85.	1.01	18.10	218	.02	.02	.00	777.
1.01	6.15	75	.07	.04	.02	130.	1.01	18.15	219	.02	.02	.00	498.
1.01	6.20	76	.07	.05	.02	164.	1.01	18.20	220	.02	.02	.00	304.
1.01	6.25	77	.07	.05	.02	185.	1.01	18.25	221	.02	.02	.00	206.
1.01	6.30	78	.07	.05	.02	199.	1.01	18.30	222	.02	.02	.00	151.
1.01	6.35	79	.07	.05	.02	209.	1.01	18.35	223	.02	.02	.00	122.
1.01	6.40	80	.07	.05	.02	217.	1.01	18.40	224	.02	.02	.00	107.
1.01	6.45	81	.07	.05	.02	224.	1.01	18.45	225	.02	.02	.00	98.
1.01	6.50	82	.07	.05	.02	230.	1.01	18.50	226	.02	.02	.00	93.
1.01	6.55	83	.07	.05	.01	235.	1.01	18.55	227	.02	.02	.00	91.
1.01	7.00	84	.07	.05	.01	239.	1.01	19.00	228	.02	.02	.00	89.
1.01	7.05	85	.07	.06	.01	243.	1.01	19.05	229	.02	.02	.00	89.
1.01	7.10	86	.07	.06	.01	246.	1.01	19.10	230	.02	.02	.00	89.
1.01	7.15	87	.07	.06	.01	250.	1.01	19.15	231	.02	.02	.00	89.
1.01	7.20	88	.07	.06	.01	253.	1.01	19.20	232	.02	.02	.00	89.
1.01	7.25	89	.07	.06	.01	256.	1.01	19.25	233	.02	.02	.00	89.
1.01	7.30	90	.07	.06	.01	258.	1.01	19.30	234	.02	.02	.00	89.
1.01	7.35	91	.07	.06	.01	261.	1.01	19.35	235	.02	.02	.00	89.
1.01	7.40	92	.07	.06	.01	263.	1.01	19.40	236	.02	.02	.00	89.
1.01	7.45	93	.07	.06	.01	265.	1.01	19.45	237	.02	.02	.00	89.
1.01	7.50	94	.07	.06	.01	267.	1.01	19.50	238	.02	.02	.00	89.
1.01	7.55	95	.07	.06	.01	269.	1.01	19.55	239	.02	.02	.00	89.
1.01	8.00	96	.07	.06	.01	271.	1.01	20.00	240	.02	.02	.00	89.
1.01	8.05	97	.07	.06	.01	273.	1.01	20.05	241	.02	.02	.00	89.
1.01	8.10	98	.07	.06	.01	274.	1.01	20.10	242	.02	.02	.00	89.
1.01	8.15	99	.07	.06	.01	276.	1.01	20.15	243	.02	.02	.00	89.
1.01	8.20	100	.07	.06	.01	277.	1.01	20.20	244	.02	.02	.00	89.
1.01	8.25	101	.07	.06	.01	278.	1.01	20.25	245	.02	.02	.00	89.
1.01	8.30	102	.07	.06	.01	280.	1.01	20.30	246	.02	.02	.00	89.
1.01	8.35	103	.07	.06	.01	281.	1.01	20.35	247	.02	.02	.00	89.
1.01	8.40	104	.07	.06	.01	282.	1.01	20.40	248	.02	.02	.00	89.
1.01	8.45	105	.07	.06	.01	283.	1.01	20.45	249	.02	.02	.00	89.
1.01	8.50	106	.07	.06	.01	284.	1.01	20.50	250	.02	.02	.00	89.
1.01	8.55	107	.07	.06	.01	285.	1.01	20.55	251	.02	.02	.00	89.
1.01	9.00	108	.07	.06	.01	286.	1.01	21.00	252	.02	.02	.00	89.
1.01	9.05	109	.07	.06	.01	287.	1.01	21.05	253	.02	.02	.00	89.
1.01	9.10	110	.07	.06	.01	288.	1.01	21.10	254	.02	.02	.00	89.
1.01	9.15	111	.07	.06	.01	289.	1.01	21.15	255	.02	.02	.00	89.
1.01	9.20	112	.07	.06	.00	289.	1.01	21.20	256	.02	.02	.00	89.
1.01	9.25	113	.07	.06	.00	290.	1.01	21.25	257	.02	.02	.00	89.
1.01	9.30	114	.07	.06	.00	291.	1.01	21.30	258	.02	.02	.00	89.
1.01	9.35	115	.07	.06	.00	291.	1.01	21.35	259	.02	.02	.00	89.
1.01	9.40	116	.07	.06	.00	292.	1.01	21.40	260	.02	.02	.00	89.
1.01	9.45	117	.07	.06	.00	293.	1.01	21.45	261	.02	.02	.00	89.

1.01	9.-	114	.07	.06	.00	291.	1.01	21.30	258	.02	.02	.00	89.
1.01	9.-	115	.07	.06	.00	291.	1.01	21.35	259	.02	.02	.00	89.
1.01	9.40	116	.07	.06	.00	292.	1.01	21.40	260	.02	.02	.00	89.
1.01	9.45	117	.07	.06	.00	293.	1.01	21.45	261	.02	.02	.00	89.
1.01	9.50	118	.07	.06	.00	293.	1.01	21.50	262	.02	.02	.00	89.
1.01	9.55	119	.07	.06	.00	294.	1.01	21.55	263	.02	.02	.00	89.
1.01	10.00	120	.07	.06	.00	294.	1.01	22.00	264	.02	.02	.00	89.
1.01	10.05	121	.07	.06	.00	295.	1.01	22.05	265	.02	.02	.00	89.
1.01	10.10	122	.07	.06	.00	295.	1.01	22.10	266	.02	.02	.00	89.
1.01	10.15	123	.07	.07	.00	296.	1.01	22.15	267	.02	.02	.00	89.
1.01	10.20	124	.07	.07	.00	296.	1.01	22.20	268	.02	.02	.00	89.
1.01	10.25	125	.07	.07	.00	297.	1.01	22.25	269	.02	.02	.00	89.
1.01	10.30	126	.07	.07	.00	297.	1.01	22.30	270	.02	.02	.00	89.
1.01	10.35	127	.07	.07	.00	297.	1.01	22.35	271	.02	.02	.00	89.
1.01	10.40	128	.07	.07	.00	298.	1.01	22.40	272	.02	.02	.00	89.
1.01	10.45	129	.07	.07	.00	298.	1.01	22.45	273	.02	.02	.00	89.
1.01	10.50	130	.07	.07	.00	299.	1.01	22.50	274	.02	.02	.00	89.
1.01	10.55	131	.07	.07	.00	299.	1.01	22.55	275	.02	.02	.00	89.
1.01	11.00	132	.07	.07	.00	299.	1.01	23.00	276	.02	.02	.00	89.
1.01	11.05	133	.07	.07	.00	300.	1.01	23.05	277	.02	.02	.00	89.
1.01	11.10	134	.07	.07	.00	300.	1.01	23.10	278	.02	.02	.00	89.
1.01	11.15	135	.07	.07	.00	300.	1.01	23.15	279	.02	.02	.00	89.
1.01	11.20	136	.07	.07	.00	301.	1.01	23.20	280	.02	.02	.00	89.
1.01	11.25	137	.07	.07	.00	301.	1.01	23.25	281	.02	.02	.00	89.
1.01	11.30	138	.07	.07	.00	301.	1.01	23.30	282	.02	.02	.00	89.
1.01	11.35	139	.07	.07	.00	301.	1.01	23.35	283	.02	.02	.00	89.
1.01	11.40	140	.07	.07	.00	302.	1.01	23.40	284	.02	.02	.00	89.
1.01	11.45	141	.07	.07	.00	302.	1.01	23.45	285	.02	.02	.00	89.
1.01	11.50	142	.07	.07	.00	302.	1.01	23.50	286	.02	.02	.00	89.
1.01	11.55	143	.07	.07	.00	302.	1.01	23.55	287	.02	.02	.00	89.
1.01	12.00	144	.07	.07	.00	303.	1.02	0.00	288	.02	.02	.00	89.
									SUM	33.80	32.36	1.44	147979.
										(859.)(822.)(37.)(4190.30)			

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	7050.	1655.	514.	514.	147920.
CMS	200.	47.	15.	15.	4189.
INCHES		26.09	32.39	32.39	32.39
MM		662.71	822.75	822.75	822.75
AC-FT		821.	1019.	1019.	1019.
THOUS CU M		1012.	1257.	1257.	1257.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 1

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	7050.	1655.	514.	514.	147920.
CMS	200.	47.	15.	15.	4189.
INCHES		26.09	32.39	32.39	32.39
MM		662.71	822.75	822.75	822.75
AC-FT		821.	1019.	1019.	1019.
THOUS CU M		1012.	1257.	1257.	1257.

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIO 1 1.00	RATIO 2 .10	RATIO 3 .15	RATIO 4 .20	RATIO 5 .30	RATIO 6 .50
HYDROGRAPH AT	1	.59	1	7050.	705.	1057.	1410.	2115.	3525.
	(	1.53)	(	199.62)(	19.96)(	29.94)(	39.92)(	59.89)(	99.81)(
ROUTED TO	2	.59	1	5779.	92.	247.	561.	1183.	2352.
	(	1.53)	(	163.64)(	2.60)(	7.00)(	15.88)(	33.50)(	66.59)(

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1161.00	1161.00	1164.10
STORAGE	251.	251.	343.
OUTFLOW	0.	0.	300.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	1167.57	3.47	453.	5779.	6.83	15.83	0.00
.10	1163.24	0.00	317.	92.	0.00	18.08	0.00
.15	1163.89	0.00	336.	247.	0.00	16.33	0.00
.20	1164.49	.39	355.	561.	1.58	16.08	0.00
.30	1165.26	1.16	378.	1183.	3.08	16.00	0.00
.50	1166.17	2.08	407.	2352.	5.17	15.92	0.00

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I*********************************
 FLOOD HYDROGRAPH PACKAGE (HEC-1)
 DAM SAFETY VERSION      JULY 1978
   LAST MODIFICATION  12 SEP 78
 *********************************
E01.
E>QO
G>CLB,ZISFT
E>E,AZ
AZ          ZISFT PAD SALAD DO
E>E
AJ          SOS HYDROGRAPHS PEP AND ZPEP
E>P
AZ          ZISFE PAT SALAD DO
E>E AZ            ZISFEDMAL ZEP IUPIEP PAT SALAD FC
E>P
AZ              ZISFE PAT AND IUPIER PAT SALAD TO
E>E,FI
FI        CALCULATIOL OF INFLOW HYDROGRAPH CI ZISFT IAP
E>C /ZISFT/TPESTP/
FI        CALCULATION OF INFLOW HYDROGRAPH OF IUPPER PAT
E>U
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